SAWTOOTH FISH HATCHERY AND EAST FORK SATELLITE

1985 Spring Chinook Salmon Brood Year Report
and
1986 Steelhead Brood Year Report

Prepared for U.S. Fish and Wildlife Service
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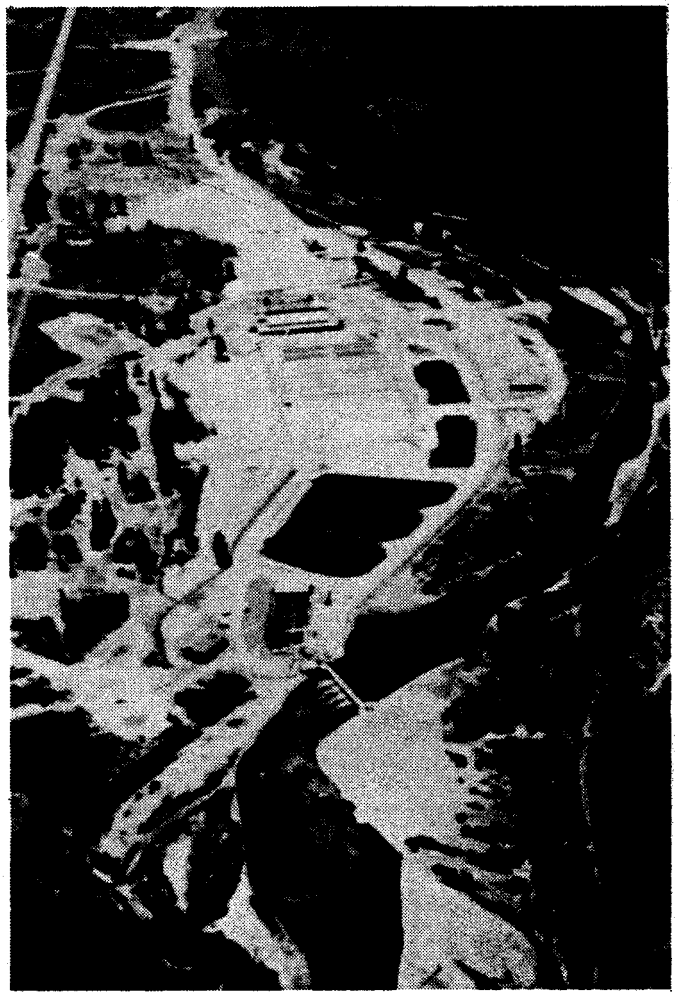

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HATCHERY DESCRIPTION

Sawtooth Fish Hatchery is part of the Lower Snake River Compensation Plan and has been in operation since 1985. Mitigation goals are for production of 2,400,000 spring chinook smolts and 4,500,000 steelhead eggs which are to be reared at Hagerman National and Magic Valley hatcheries. A satellite station located on the East Fork of the Salmon River includes trapping, holding, and spawning facilities for salmon and steelhead.

Sawtooth Hatchery receives its water from the Salmon River and three production wells. The wells provide 7.8 cfs and maintain a minimum temperature of 40 F in winter and up to 50 F during the latter part of the summer. The river provides up to 35 cfs of water, with temperature variations from 32 F to 68 F. Rearing water from the river enters an intake structure located 1/2 mile upstream from the hatchery building and runs through a 54-inch pipe to a control box located in the hatchery building, where final screening is accomplished. Incubation water can be provided from either wells or the Salmon River. Indoor rearing vats may utilize either well or river water, with excess well water spilled back into the control box for use in the outside raceways.

Production facilities include: 100 stacks of FAL incubators containing 800 trays; 16 indoor rearing vats, each with 400 cubic feet of rearing space; 12 outside fry raceways, each with 750 cubic feet of rearing space; and 28 final rearing raceways, each with 3,600 cubic feet of rearing space. The lower sections of the raceways have serial re-use water from the top sections. The adult fish facility consists of a weir; trap; three adult holding ponds, each with 4,500 cubic feet of holding area; and a spawning area located at the upper end of the holding ponds.

1985 SPRING CHINOOK RETURNS

Returning adults to Sawtooth Hatchery in 1985 resulted from smolt releases in 1982 and 1983 and jacks returning from the 1984 release (Table 1). The trap was operated from June 14 through September 15, and fish were transferred to the adult holding ponds or released upstream for natural spawning. A total of 1,639 spring chinook were trapped, including 1,082 males and 557 females (Fig. 1). Six hundred and thirty-seven males and 377 females were held for spawning, while the remaining 445 males and 180 females were released above the weir. Ponded fish were injected with erythromycin phosphate at a dosage rate of 5 mg for every pound of fish weight to help control bacterial kidney disease (BKD).

Age composition of returning adults was done using length data. Jacks were classed as 53.3 cm (21") or less, four-year-olds were 55.9 cm (22") to 78.7 cm (31"), and five-year-olds were 81.3 cm (32") and longer (Fig. 2). Of the 1,639 fish trapped, 296 were jacks (18X), 1,178 were four-year-olds (722), and 165 were five-year-olds (10%).

Table 1. Sawtooth Hatchery smolt release and adult returns, 1985.

Brood year	Releas year	Number released	Adult Returns			Total returns	%
			Jacks	2-ocean	3-ocean		
1979	1981	None			291		
1980	1982	None	17	66	165	248	
1981	1983	186,375	49	1,182	796	2,027	1.08
1982	1984	230,550	292	922			
1983	1985	420,060	51				
1984	1986	347,484					
1985	1987	1,185,061					
		(103,661 released 10/86)					

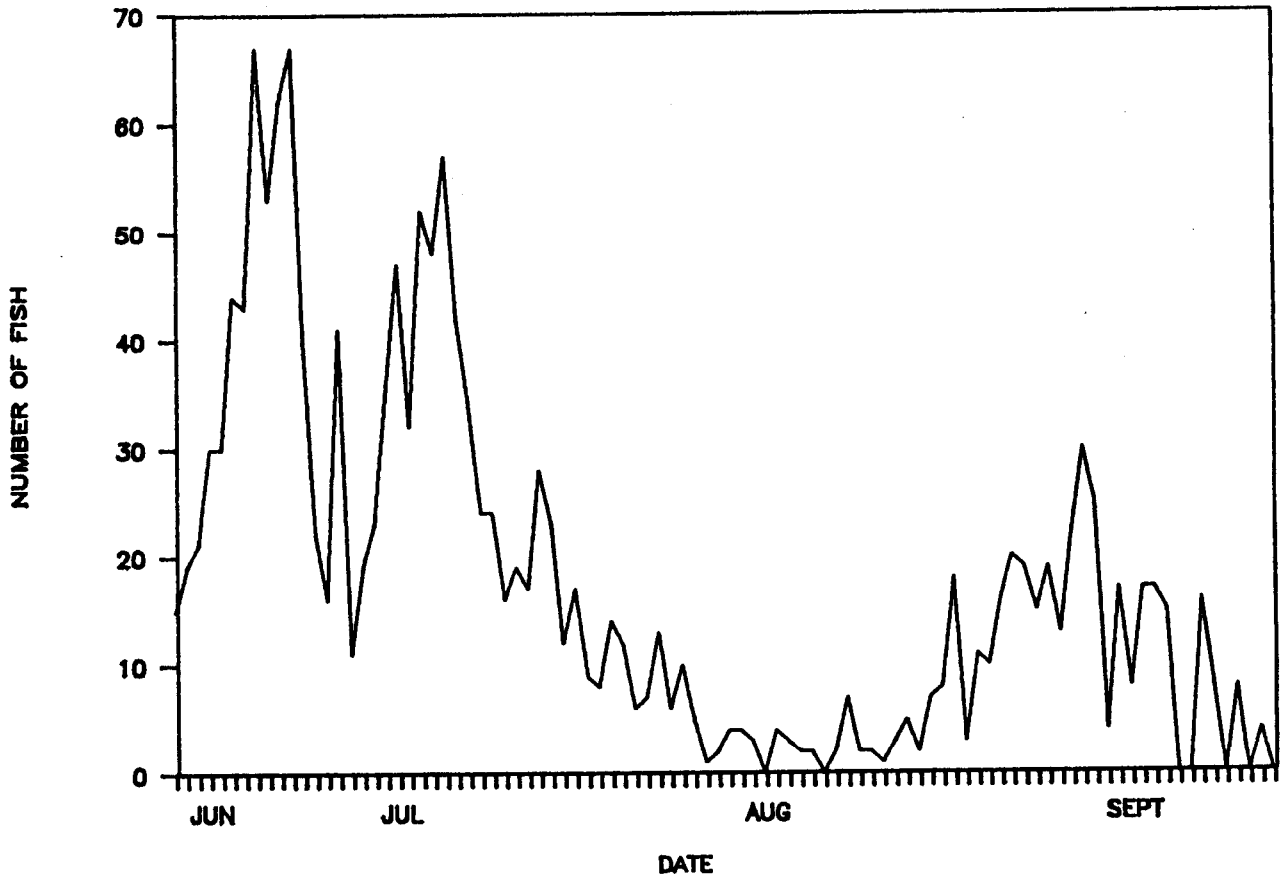

Figure 1. Run timing of adult spring chinook trapped at Sawtooth Hatchery, 1986.

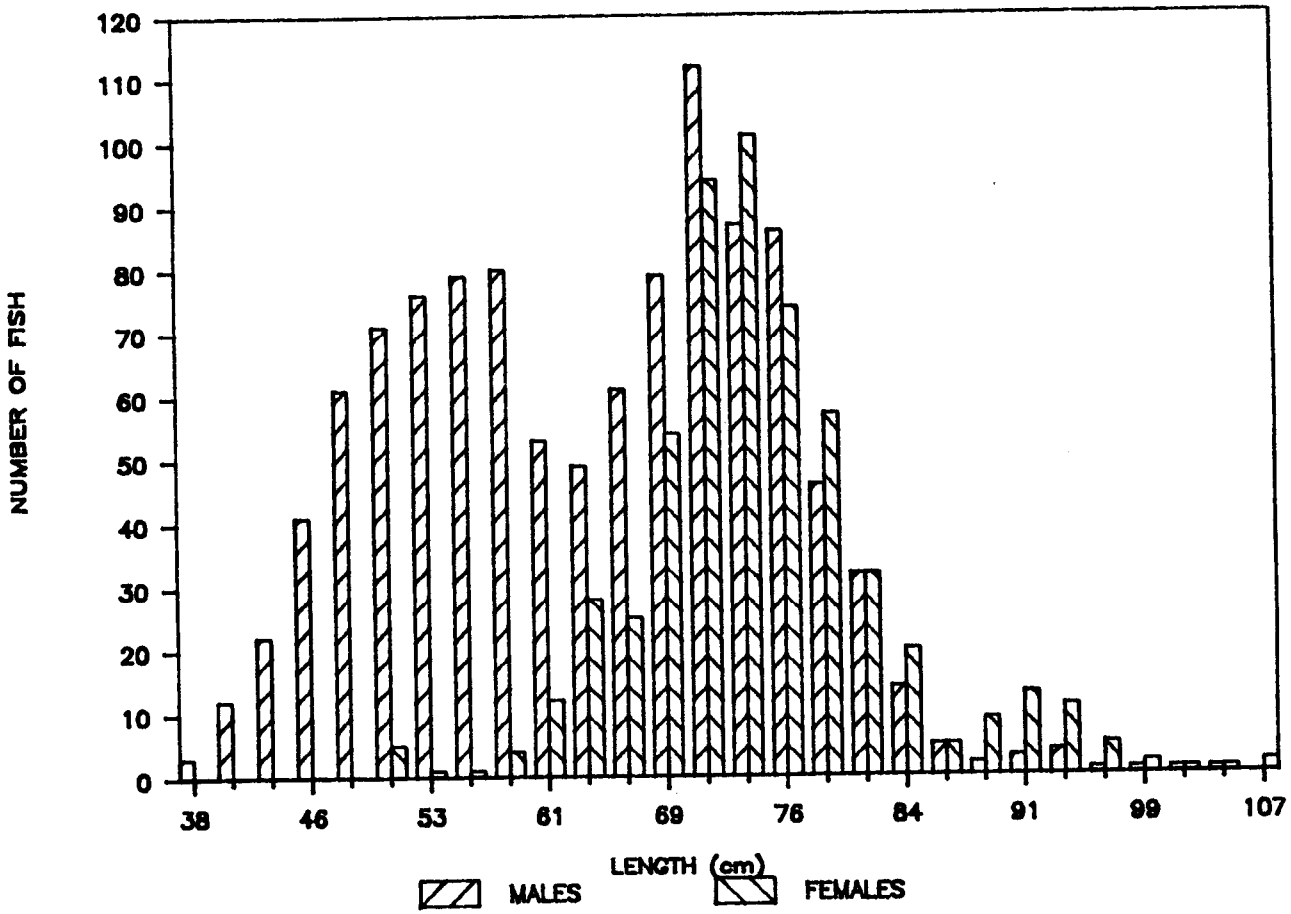

Figure 2. Adult spring chinook length frequency, Sawtooth 1985.

Trapping of chinook salmon at the East Fork facility began on June 11 and ended on September 4. The trap was checked daily, and the fish were transferred to the holding ponds or released above the velocity barrier to spawn naturally. A total of 303 adult salmon were trapped (240 males and 63 females) (Fig. 3). All returning adults were the result of natural escapement.

Age composition of the East Fork run included 50 jacks (16.5%), 194 four-year-olds (64%), and 59 five-year-olds (19.5%) (Fig. 4). One hundred and sixteen males and 45 females were spawned, and 124 males and 18 females were released upstream to spawn naturally.

ADULT SPRING CHINOOK CODED WIRE TAG RECOVERIES

All adult spring chinook were examined for fin clips and tags. Of the 1,639 fish trapped, 276 were coded wire tagged (Table 2). Tag recovery data indicated that two fish were from a group released in the Snake River at Hells Canyon in 1983 and raised at the Rapid River Hatchery.

PRESPAWNING MORTALITY

Prespawning mortality included all females which died before spawning and all males which died prior to the end of the second week of spawning. Sawtooth ponded 881 adult spring chinook, and 45 were lost to prespawning mortality (5.1%). East Fork ponded 161 adult spring chinook, and only 1 was lost to prespawning mortality.

CHINOOK SPAWNING

Spawning operations began at Sawtooth on August 5 and continued through September 2. A total of 313 females were spawned, for a total egg take of 1,418,920 green eggs; an average of 4,533 eggs per female.

East Fork spawning began on August 6 and ended on August 30. A total of 44 females were spawned, and 245,175 green eggs were taken for an average of 5,572 eggs per female.

Females were spawned using the incision method. Eggs were collected in a colander to drain off the ovarian fluid. Eggs from three females were then placed into a spawning bucket and fertilized with the pooled sperm from five males. Males utilized for spawning included 1% to 3Z jacks. The fertilized eggs were allowed to set for three minutes after adding one cup of well water. The eggs were then rinsed in well water and water hardened in 100 ppm buffered Argentyne for one hour.

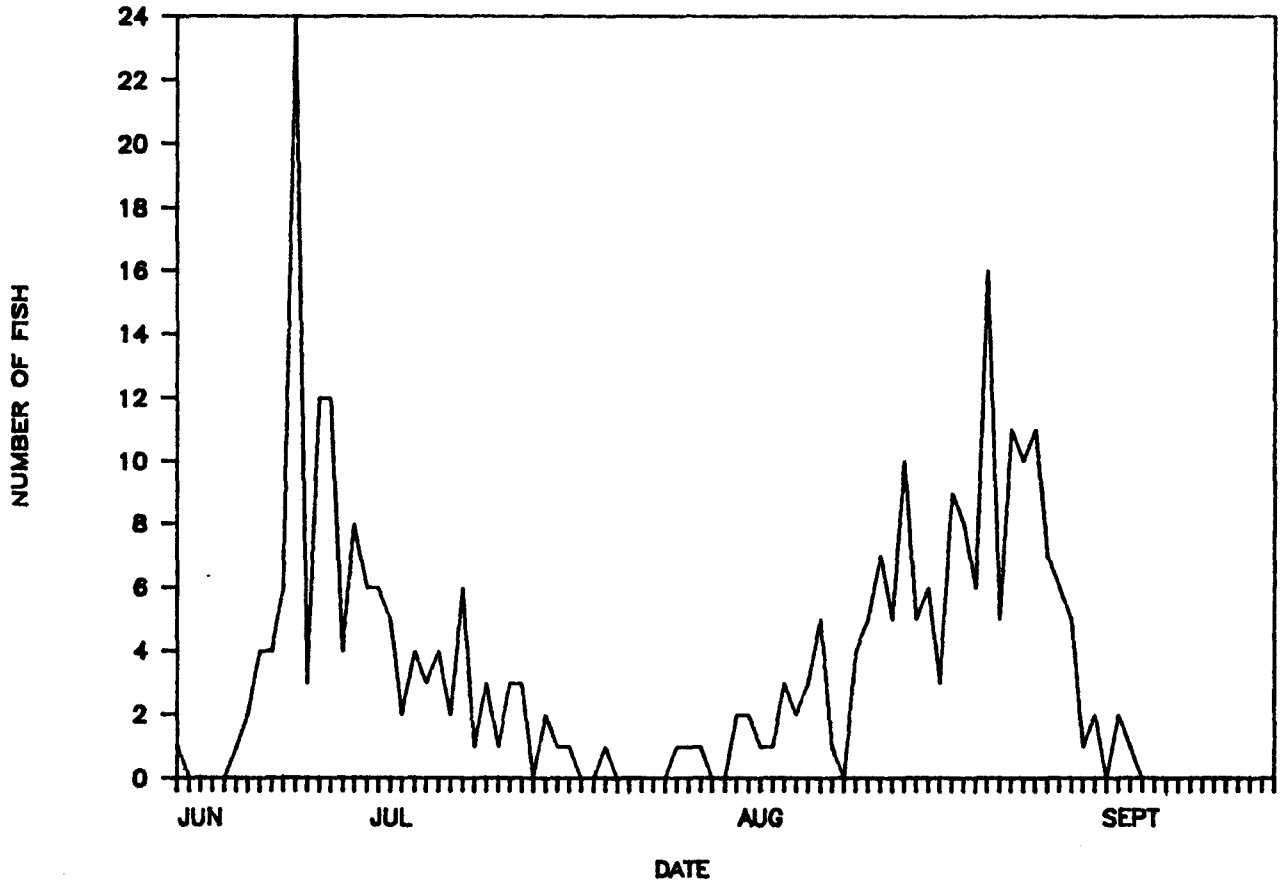

Figure 3. Run timing of adult spring chinook trapped at the East Fork, 1985.

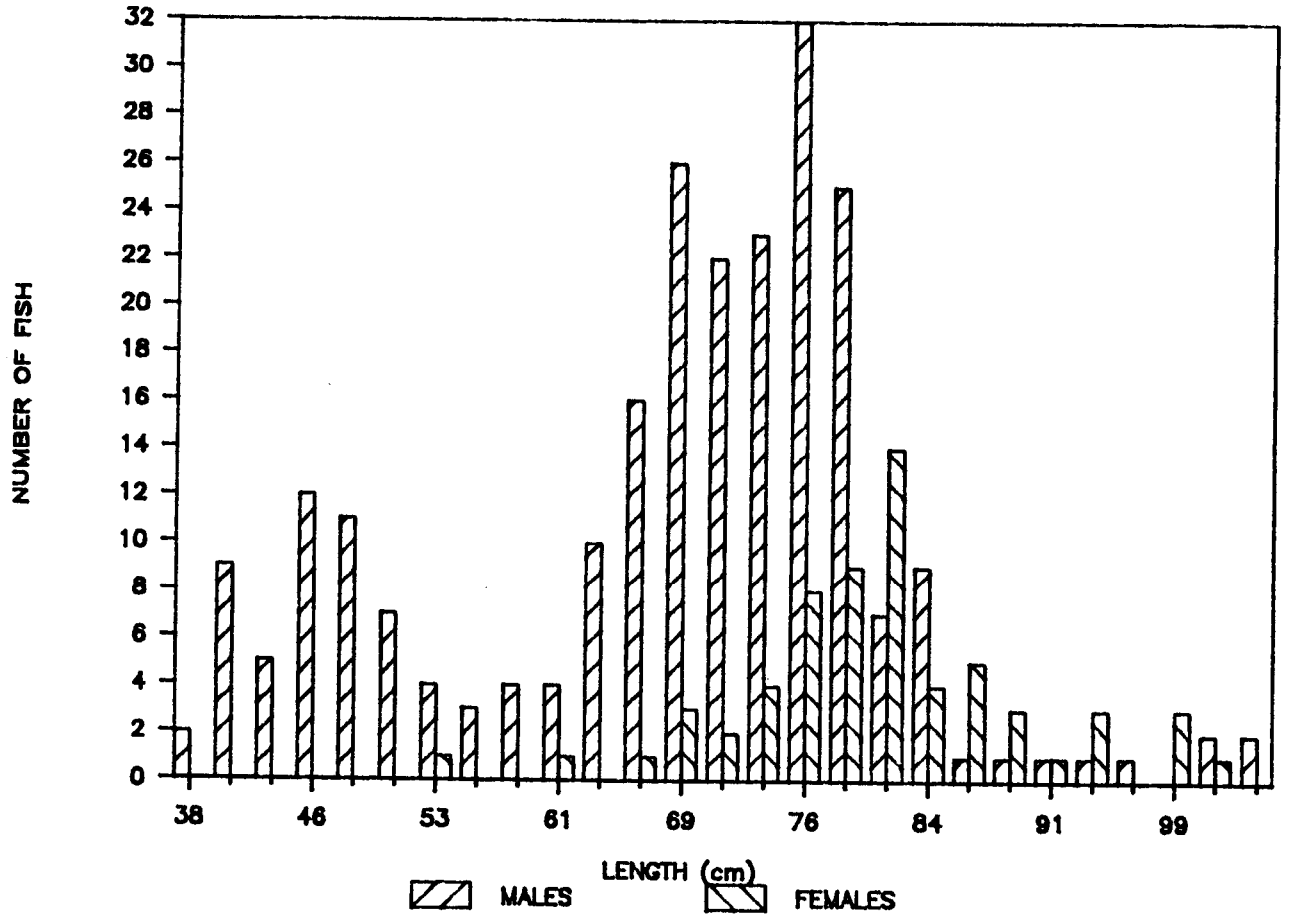

Figure 4. Adult spring chinook length frequency, East Fork 1985.

Table 2. Sawtooth coded wire tag recoveries from adult spring chinook.

Tag code	Brood year	Release year	Tags released	Tags recovered	Group release
102408	1981	1983	35,075	50	186,375
102535	1981	1983	51,450	69	(same)
102708	1982	1984	51,025	83	230,550
102709	1982	1984	50,600	72	(same)
Total			188,150	274	416,925

CHINOOK EGGS

After fertilization and water hardening, eggs were placed into incubators at 85 ounces per tray. The incubation water was set at a flow of 5 gpm per stack, and temperatures ranged from 50 F to 43 F (Fig. 5). To prevent fungus growth, eggs were treated with formalin three times a week at a concentration of 1,667 ppm. This treatment was discontinued after the eggs were eyed and picked.

Eggs eyed up at 550 temperature units, at which time they were shocked and picked. A Jensorter egg picker and counter was utilized to determine the total number of eggs on hand, eye-up percentage, and number of eggs remaining to hatch. An eye-up percentage of 92.9% was obtained for Sawtooth and 89.4% for the East Fork eggs. Eyed eggs were measured back into the incubator trays at 85 ounces per tray and began to hatch at 900 temperature units.

An additional 2,535,639 green eggs were received from Rapid River Hatchery, and a 74.42 eye-up was achieved. These eggs will be reared at Sawtooth and released into the Clearwater River drainage as smolts.

CHINOOK FRY

Swim-up chinook fry were moved to the indoor rearing vats at approximately 1,650 temperature units. Fry were placed into the vats at approximately 200,000 fish per vat at 100 gpm and in 90 cubic feet of rearing space. Rearing densities were adjusted by increasing the rearing space as the fish grew. An optimum density index was determined through an evaluation project in which several vats were loaded at different densities (McGehee 1986). A maximum density index was found to be 0.8 for the indoor rearing vats. Density indexes ranged from 0.5 to 1.2 during the test.

Initial feeding was begun with OMP IV starter mash and 1/32" pellets. Fish were fed mash for three days, mash mixed with 1/32" for seven days, then entirely 1/32" until they reached 400 fish per pound. When they reached 400 fish per pound, the 1/32" was mixed 50% with OMP IV 3/64" pellets for seven days, then feed was switched to 1002 OMP IV 3/64".

Chinook fry mortality was minimal until the fish reached 450 per pound. At that time, we began seeing an increase in mortality which varied, depending on stock and vat, from 32 to 28%. This mortality was attributed to "Spring Thing" or "Clubbed Gill Dropout" disease. Mortality dropped off when the fish reached 250 fish per pound.

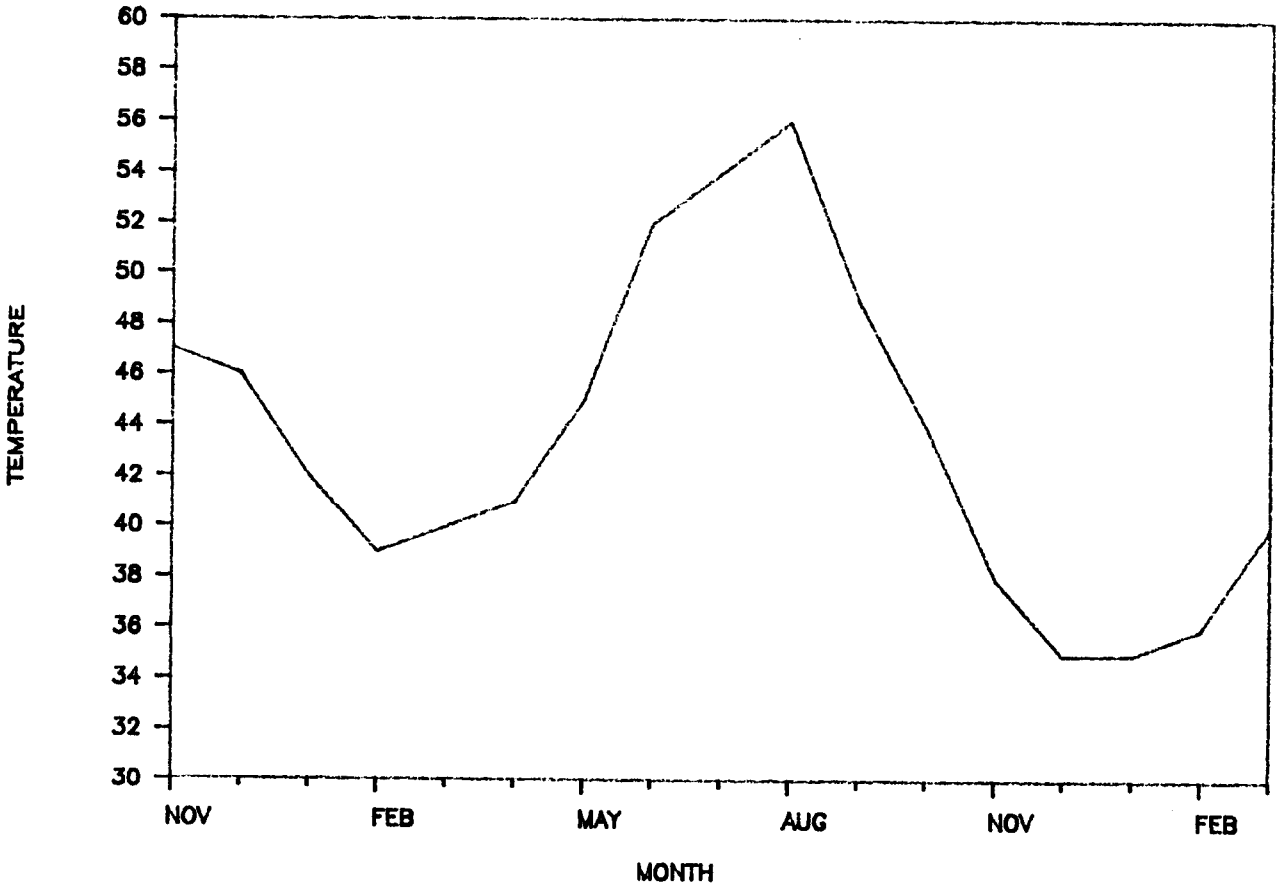

Figure 5. Sawtooth Hatchery water temperatures, 1985-86.

CHINOOK FINGERLINGS

Fish were moved to the outside raceways from March 25 through May 13. They averaged 250 fish per pound, and approximately 200,000 fish were placed into 2,698 cubic feet of rearing space. Water flows were set at 1.5 cfs per raceway and the density index at .35 or less. When the fish reached the maximum density index, they were given 5,396 cubic feet of rearing space. This occurred in mid-July when the fish were approximately 45 fish per pound. Water flow was increased to 2.5 cfs during July through October 1986, then decreased to 1.5 cfs through the winter until fish were released or planted.

Fingerlings were switched to 1/16" OMP IV pellets when they reached 200 fish per pound, then to 3/32" OMP IV pellets at 100 fish per pound. Fish were fed 1/8" OMP IV until released.

CHINOOK SMOLTS

In March 1987, chinook smolts were evaluated for condition and disease by hatchery personnel. They were found to be in fair condition, with some fin fraying and a slight decrease in fat content compared to past smolts. BKD incidence was monitored by using the flourescent antibody test throughout the rearing cycle of these fish, with approximately 12% testing positive. Smolts were sampled for descaling before release, with no descaling problems noted. Additional smolt evaluation was done by IDFG pathology personnel, but the results were not received or reported to the hatchery at the time of this report.

Chinook smolts from Rapid River stock were planted in the Clearwater drainage. A total of 693,320 were released in the upper Lochsa River, of which 348,420 were fall plants and 344,900 were spring plants. Red River received 195,200 smolts; 96,400 were fall plants and 98,800 were spring plants. Crooked River received 478,800 smolts; 251,300 were fall plants and 227,500 were spring plants. Smolts released in the fall averaged 28 fish per pound, and spring 1987 plants averaged 25 fish per pound.

Sawtooth raceway screens were pulled on March 11, 1987, and the remaining smolts were released on March 13, 1987. A total of 1,185,061 fish were stocked with 103,661 being planted in the fall of 1986. All fall-released fish were left-ventral fin clipped. The remaining 1,081,400 fish were released in the spring. The fall-released fish averaged 25 fish per pound, and the spring-released fish averaged 22.9 fish per pound.

East Fork smolts were planted at the East Fork trap site on March 20, 1987 and totaled 195,100 fish. They averaged 25 fish per pound. Total survival from green eggs to release was: Sawtooth 83.5%, East Fork 79.6%, and Rapid River 53.9% (Table 3).

Table 3. 1985 brood year spring chinook survival from green eggs to released smolts.

Green eggs	Eyed eggs	(%)	Swim-up	(%)	Released	(Z)
Sawtooth						
1,418,920	1,317,441	(92.9)	1,309,663	(92.3)	1,185,061	(83.5)
East Fork						
245,175	219,097	(89.4)	209,625	(85.5)	195,100	(79.6)
Rapid River						
2,535,639	1,887,373	(74.4)	1,835,802	(72.4)	1,367,32	(53.9)

PRODUCTION COSTS

The cost of producing chinook smolts at both the Sawtooth and East Fork facilities is summarized in Table 4. An overall conversion of 1.58 was attained on all three groups of chinook during the rearing period.

1986 ADULT STEELHEAD RETURNS

The 1986 adult steelhead returns were from 107,284 smolts released in 1983 and 681,314 smolts released in 1984, reared and planted by Hagerman National and Magic Valley hatcheries (Table 5). Some returns were also from natural spawning fish.

The Sawtooth fish trap was installed on March 13, 1986 and was operated through April 23, 1986. A total of 2,212 adult steelhead were trapped during this time (Fig. 6). This total included 1,271 males and 941 females. These fish consisted of 2,079 one-ocean A's, 116 two-ocean A's, and 59 B-run fish (Fig. 7). The following criteria were used for determining age groups: males--one-ocean A's were 69 cm (27") or less; two-ocean A's were 71 cm (28") to 79 cm (31"); and B's were greater than 80 cm (32"); females--one-ocean A's were 64 cm (25") or less; two-ocean A's were 66 cm (26") to 74 cm (29"); and B's were greater than 76 cm (30"). One thousand and fifty-six fish were released upstream to spawn naturally. Thirty of the released steelhead were wild or natural fish.

The 1986 East Fork steelhead returns were from 58,384 smolts released in 1982, 324,325 smolts released in 1983, and 393,452 smolts released in 1984 that were reared and planted by Hagerman National Hatchery, Magic Valley Hatchery, and Niagara Springs Hatchery. Some returns were also from natural spawning fish.

Table 4. 1985 brood year spring chinook production costs and feed conversion.

Lbs. of fish produced	Lbs. of feed fed	Feed cost	Conversion	Cost per lb. produced
111,169	177,226	$88,883.00	1.59	$.80

Sawtooth		East Fork	
Personnel costs	$189,000.00	Personnel costs	$14,375.00
Operating costs	264,269.00	Operating costs	9,000.00
Capital outlay	5,000.00	Capital outlay	1,000.00
Program total*	$408,269.00	Program total	$24,375.00

*Costs estimated for entire 18-month rearing cycle.

Table 5. Steelhead smolt releases.

Date released	Hatchery rearing	Number	Marks	Stock
Sawtooth				
1983	HNFH	40,573	51333	A
1983	HNFH	40,538	51334	A
1983	HNFH	26,173	RV	B
1984	HNFH	40,322	51029	A
1984	HNFH	39,763	51028	A
1984	HNFH	397,079	NONE	A
1984	MV	204,150	NONE	A
Total		788,598		
East Fork				
1982	HNFH	58,384	NONE	B
1983	HNFH	31,348	LV	A
1983	HNFH	38,864	102460	B
1983	MV	49,140	NONE	B
1983	HNFH	162,723	NONE	B
1983	NIA. SPR.	42,250	NONE	B
1984	HNFH	393,452	NONE	B
Total		776,161		

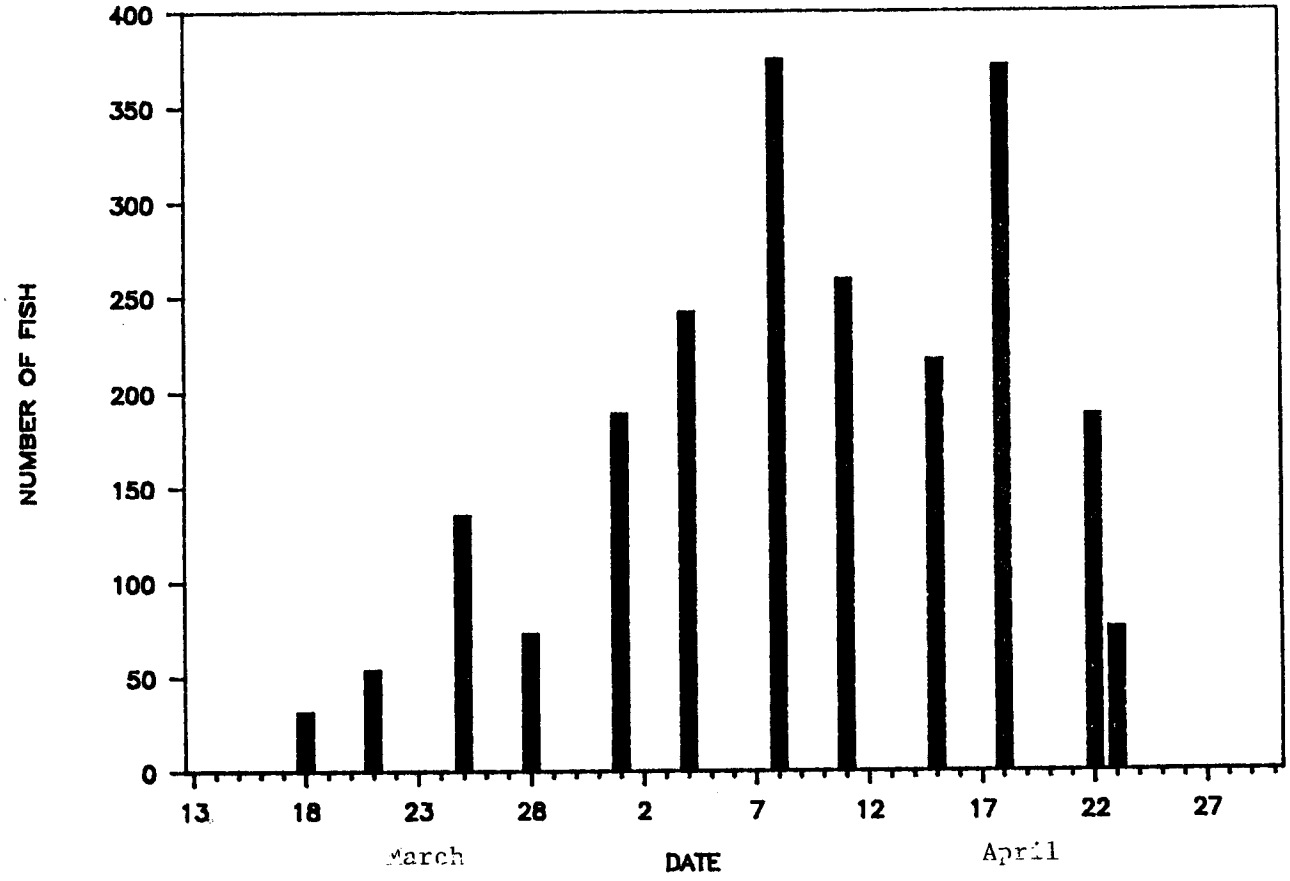

Figure 6. Run timing of adult steelhead trapped at Sawtooth Hatchery, 1986.

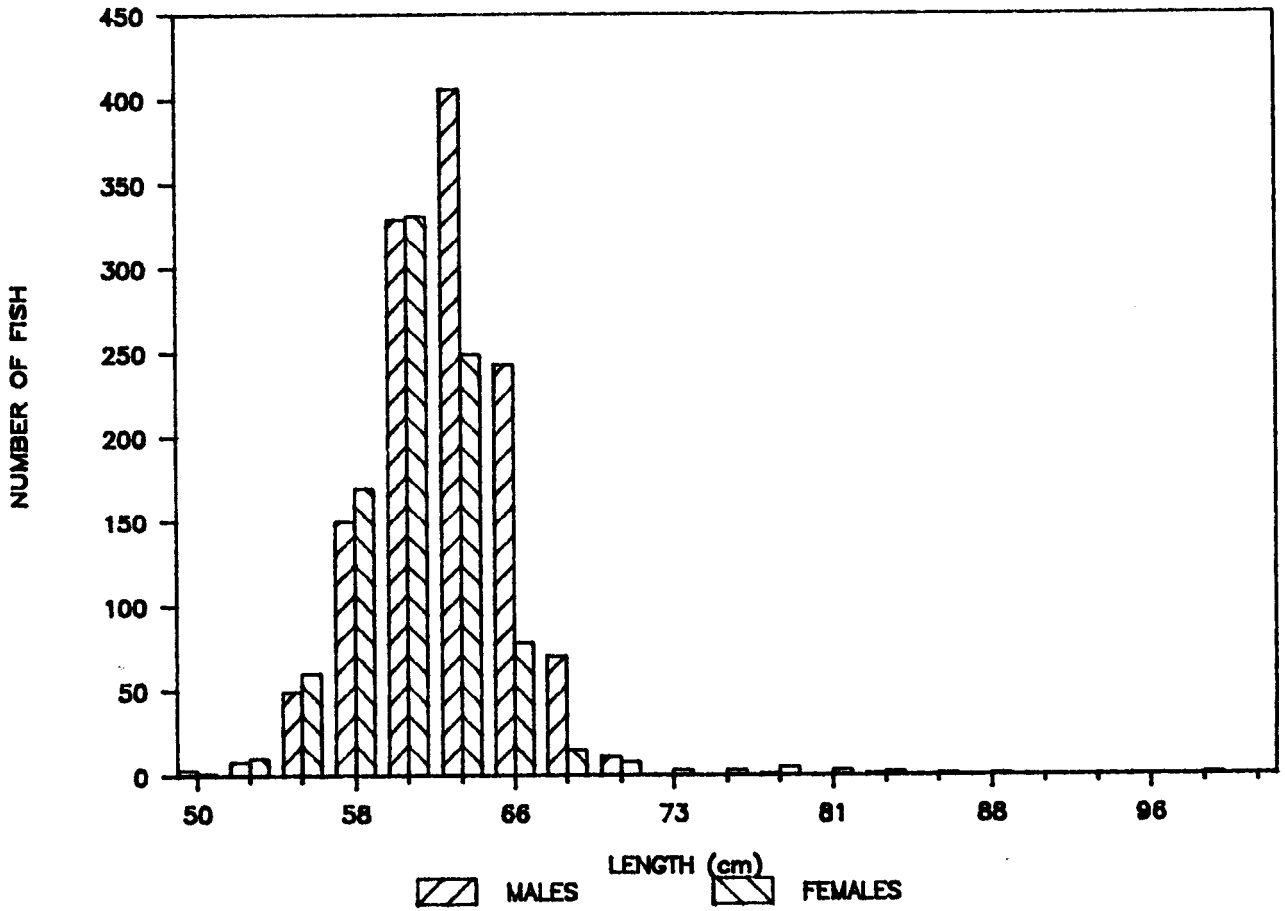

Figure 7. Adult steelhead length frequency, Sawtooth 1985.

The East Fork fish trap and velocity barrier was put into operation on March 17, 1986 and operated through April 27, 1986. A total of 443 adult steelhead (266 males, 177 females) were trapped during this period (Fig. 8). These fish consisted of 184 one-ocean A's, 93 two-ocean A's, and 166 B-run fish as determined by length frequency (Fig. 9). Adult B-run steelhead were also hauled from Pahsimeroi Hatchery to the East Fork holding ponds for spawning. All Pahsimeroi fish were marked and spawned separately from the East Fork fish, and all eggs taken were utilized for fry plants. Four hundred and sixty-five fish were released upstream to spawn naturally. All A-run fish trapped at the East Fork were hauled to the Yankee Fork and released to spawn naturally.

ADULT STEELHEAD CODED WIRE TAG RECOVERIES

Adult steelhead were examined for fin clips and tags. Table 11 summarizes coded wire tag recovery data. Two fish were trapped at Sawtooth which had been released at Pahsimeroi Hatchery in 1982, and one fish was trapped which had been released in the North Fork of the Clearwater and reared at Dworshak Hatchery.

STEELHEAD SPAWNING

Spawning operations began at Sawtooth on March 25 and continued through April 22. A total of 2,765,760 "A" eggs were taken from 619 females in 9 spawning days. Fecundity was 4,468 eggs per female.

The East Fork spawning operation began on March 20 and continued through April 17. A total of 1,460,240 "B" eggs were taken from 215 females in 8 spawning days. This included 78 East Fork females and 137 Pahsimeroi females. Fecundity was 6,792 eggs per female.

Eggs were collected into colanders, thus draining off ovarian fluid, and then placed into a spawning bucket. Five females' eggs were fertilized with the pooled sperm from five to seven males. Fertilized eggs were allowed to set for one to three minutes. The eggs were then rinsed in well water and water hardened in a 200 ppm Argentyne solution for one hour. Eggs were placed in coolers containing water and ice to maintain a temperature of approximately 40 degrees and then shipped to the incubation facility at Sawtooth Hatchery.

DISEASE SAMPLING

One group of 60 females was sampled for virus at the Sawtooth facility. Kidney, spleen, and gill filaments were taken in five fish pools and shipped to our pathologist for testing. Two of the five fish pools tested positive for IPN virus. Seventy females were similarly sampled at the East Fork facility for virus using five fish pools, and all samples returned negative for IPN and IHN.

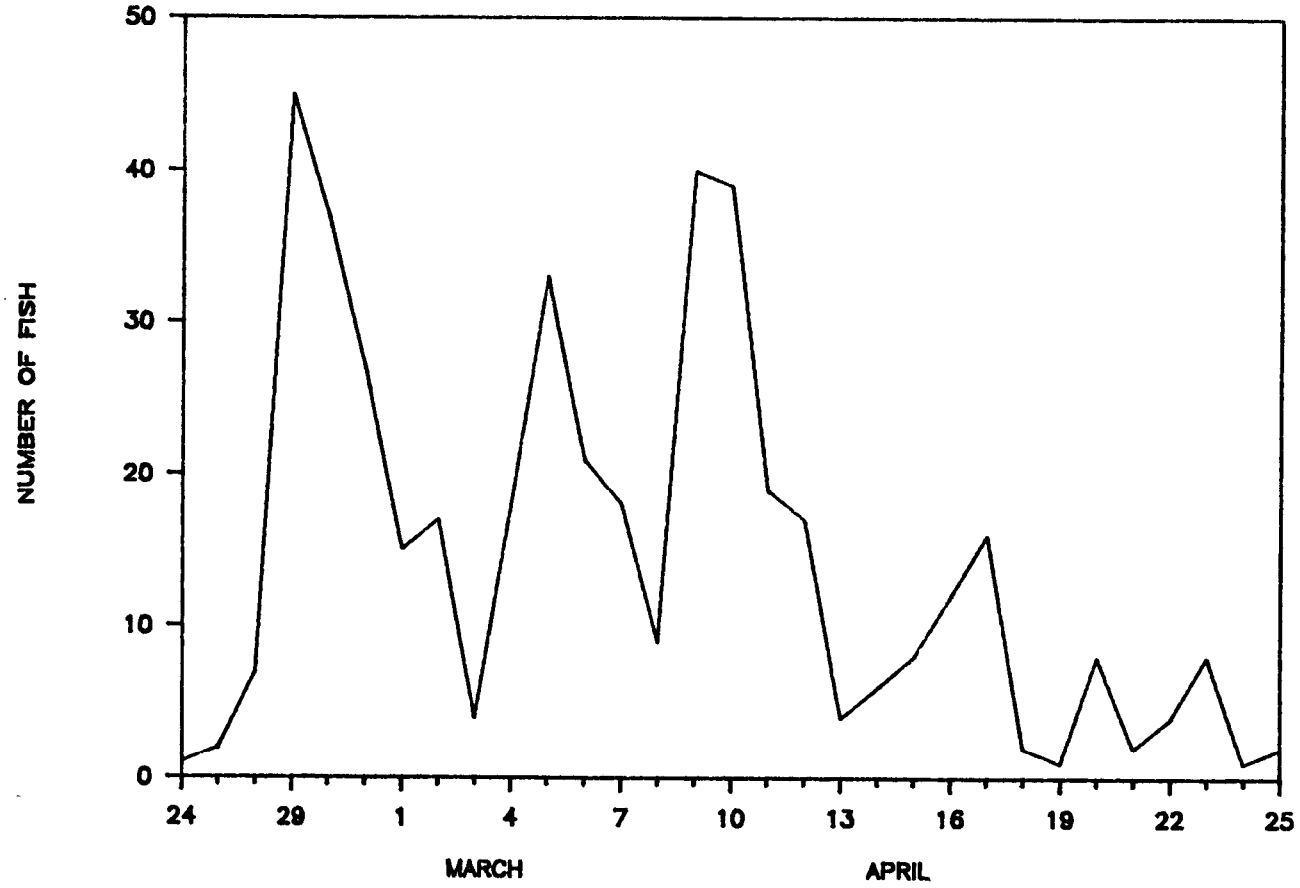

Figure 8. Run timing of adult steelhead trapped at the East Fork, 1986.

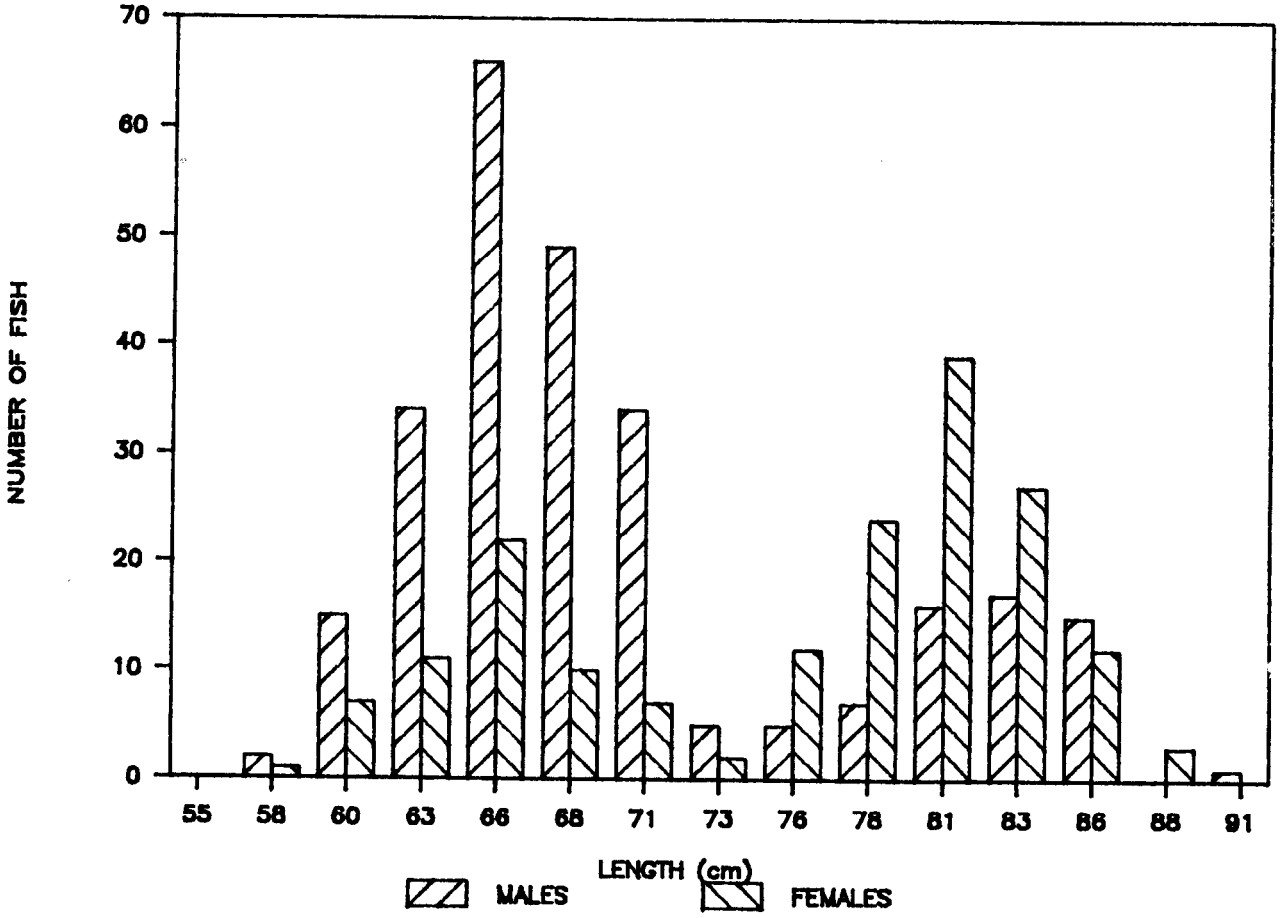

Figure 9. Adult steelhead length frequency, East Fork 1985.

FISH DISPOSITION

One thousand and twelve Sawtooth steelhead kelts were given to the public, 1,056 fish were released to spawn naturally, and the remaining 144 were placed into a freezer trailer and hauled to a rendering plant (Table 6). Sixty East Fork steelhead kelts were given to the public, 465 fish were released to spawn naturally, and 195 were placed into a freezer trailer and hauled to a rendering plant (Table 6).

STEELHEAD EGGS

After water hardening, eggs were placed into incubators at 70 ounces per tray (approximately 16,000 eggs). After 72 hours, all eggs were treated with formalin at a rate of 1,667 ppm in a 15-minute drip three times a week until eye-up. The eggs eyed-up at 350 temperature units, at which time they were shocked and picked. After eye-up, 920,230 "A" eggs and 867,347 "B" eggs were shipped to the Hagerman National Hatchery for rearing. The remaining eggs were incubated at Sawtooth, with the resultant fry used for outplanting in the Salmon River drainage. A total of 2,366,983 eyed "A" eggs resulted from the 2,665,138 green eggs taken at Sawtooth for an 88.7Z eye-up, while 1,211,996 eyed "B" eggs taken at the East Fork survived (86.9% eye-up).

STOCKING

Hagerman National Hatchery began stocking smolts at Sawtooth on March 26 and at the East Fork on March 27 and continued until April 15. Sawtooth received 687,634 "A" smolts which averaged 4.58 fish per pound, or 150,030 pounds. The East Fork received 485,078 "B" smolts which averaged 4.51 fish per pound, or 107,630 pounds. The survival rate from eyed eggs to smolt release was 83Z for Sawtooth A's and 56% for East Fork B's. A total of 1,433,731 "A" fry and 339,546 "B" fry were stocked into the upper Salmon River tributaries and the East Fork of the Salmon River.

Table 6. Summary of steelhead trapped, spawned and released, and kelt disposition at Sawtooth and East Fork facilities, 1986.

Steelhead: Sawtooth Hatchery

Fish trapped: 2,212		Fish disposal:	
One-ocean A's:	2,079	Given to the public:	1,012
Two-ocean A's:	116	Released:	1,056
B run fish:	17	Freezer trailer:	144
Total trapped:	2,212	Total:	2,212

Fish disposition:

Females:
619 spawned and given to the public
322 released to spawn naturally 941 total

Males:
393 spawned and given to the public
144 spawned and/or killed and put in the freezer trailer
734 released or spawned and released
1,271 total

Steelhead: East Fork

Fish trapped: 443		Fish disposal:	
One-ocean A's:	184		
Two-ocean A's:	93	Given to the public:	60
B run fish:	166	Released:	465
Total trapped:	443	Freezer trailer:	195
		Total:	720

Pahsimeroi B's hauled to the E.F.: 277 (79 males, 198 females)
Total fish: 720 (345 males, 375 females)

Fish disposition:

Females:
20 spawned and given to the public
160 released to spawn naturally
195 spawned and put in the freezer trailer
375 total

Males:
40 spawned (given to the public)
305 released to spawn naturally
345 total

APPENDICES

Appendix 1. 1985 Sawtooth spring chinook length frequency.

Length (cm)	Males	Females	Fish trapped	Length (in)
38	3	0	3	15
41	12	0	12	16
43	22	0	22	17
46	41	0	41	18
48	61	0	61	19
51	71	5	76	20
53	76	1	77	21
56	79	1	80	22
58	80	4	84	23
61	53	12	65	24
64	49	28	77	25
66	61	25	86	26
69	79	54	133	27
71	112	94	206	28
74	87	101	188	29
76	86	74	160	30
79	46	57	103	31
81	32	32	64	32
84	14	20	34	33
86	5	5	10	34
89	2	9	11	35
91	3	13	16	36
94	4	11	15	37
97	1	5	6	38
99	1	2	3	39
102	1	1	2	40
104	1	1	2	41
107	0	2	2	42
TOTAL	1,082	557	1,639	

Appendix 2. Length frequency distribution of East Fork spring chinook, 1985.

Length (cm)	Males	Females	Fish trapped	Lengt (in)
38	2	0	2	15
41	9	0	9	16
43	5	0	5	17
46	12	0	12	18
48	11	0	11	19
51	7	0	7	20
53	4	1	5	21
56	3	0	3	22
58	4	0	4	23
61	4	1	5	24
64	10	0	10	25
66	16	1	17	26
69	26	3	29	27
71	22	2	24	28
74	23	4	27	29
76	32	8	40	30
79	25	9	34	31
81	7	14	21	32
84	9	4	13	33
86	1	5	6	34
89	1	3	4	35
91	1	1	2	36
94	1	3	4	37
97	1	0	1	38
99	0	3	3	39
102	2	1	3	40
104	2	0	2	41
Total	240	63	303	

Appendix 3. Length frequency distribution for steelhead adults trapped at Sawtooth and East Fork facilities.

Length (cm)	Males	Females	Fish trapped	Length (in)
Sawtooth fish				
50	3	1	4	20
53	8	10	18	21
55	49	60	109	22
58	150	170	320	23
60	329	331	660	24
63	406	249	655	25
66	243	78	321	26
68	70	15	85	27
71	11	8	19	28
73	0	3	3	29
76	0	3	3	30
78	1	5	6	31
81	0	3	3	32
83	1	2	3	33
86	0	1	1	34
88	0	1	1	35
91	0	0	0	36
93	0	0	0	37
96	0	0	0	38
99	0	1	1	39
101	0	0	0	40
Totals	1,271	941	2,212	
East Fork fish				
55	0	0	0	22
58	2	1	3	23
60	15	7	22	24
63	34	11	45	25
66	66	22	88	26
68	49	10	59	27
71	34	7	41	28
73	5	2	7	29
76	5	12	17	30
78	7	24	31	31
81	16	39	55	32
83	17	27	44	33
86	15	12	27	34
88	0	3	3	35
91	1	0	1	36
Totals	266	177	443	

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